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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/667,831	09/22/2003	Stephen P. Cole	FO01-P03	1005

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EXAMINER	
HUGHES, SCOTT A	

ART UNIT	PAPER NUMBER
3663	

DATE MAILED: 04/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	10/667,831	COLE ET AL.
	Examiner	Art Unit
	Scott A Hughes	3663

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *9/22/2003 and 4/15/2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 1-22 are rejected under 35 U.S.C. 102(a) as being anticipated by Cole (Cole, Lumley, Meadows, and Tura; "Reservoir Characterization and Time-Lapse: Rock Properties and Attributes").

With regard to claim 1, Cole discloses a method of modeling seismic data. Cole discloses deriving a time-lapse data set from a first seismic data set and a second seismic data set (Page 2475, Introduction; Conclusions). Cole discloses deriving a forward-modeled time-lapse data set including a plurality of values (Page 2475-2476, Forward Modeling and Qualitative Inversion). Cole discloses sorting the plurality of values bins corresponding to the forward-modeled time-lapse data set (Page 2476, second column). Cole discloses selecting a plurality of optimal values from the plurality of bins (2476, 2nd column, 2nd to last paragraph). Cole discloses mapping the plurality of optimal values in correspondence with a plurality of subterranean locations using the time-lapse data set (2476, last paragraph to 2477, first column). Cole discloses calibrating the plurality of values and plotting the plurality of calibrated optimal values (Page 2477) (Figs. 1-6).

With regard to claim 2, Cole discloses that deriving the forward-modeled time-lapse data set is defined by using at least one rock physics relationship ((2475, Introduction.)

With regard to claim 3, Cole discloses acquiring the first data set and thereafter acquiring the second data set (2475, summary). Cole discloses 4D time-lapse seismic data taken from the Schiehallion field. It is known that time-lapse data consists of at least first and second data sets taken at different times.

With regard to claims 4 and 5, Cole discloses that the first and second data sets included amplitude versus angle signal data (Summary, Introduction, and Conclusion). It is known that AVA data contains the same information as amplitude versus offset data, and that AVO data can be obtained by using the angles of the AVA data.

With regard to claim 6, Cole discloses that the first and second data sets (the time-lapse data) are from the Schiehallion field. This data is reflected acoustic wave energy data.

With regard to claim 7, Cole discloses that deriving the forward-modeled time-lapse data set uses selected pore pressure and saturation and porosity relationships (2475 second column to 2476 end of page, especially 2476 Quantitative Inversion Procedure).

With regard to claim 8, Cole discloses that deriving the time-lapse data set is defined by calibrating each of the first and second seismic data sets and subtracting the second data set from the first (2475, second column to 2476, also 2477, 1st full

paragraph). Cole discloses calibrating the time-lapse data by calibrating pseudo values against known impedances using a known reference pressure and saturation state.

With regard to claim 9, Cole discloses that deriving the time-lapse data set is defined by inverting and then calibrating each of the first and second data sets and then subtracting the second data set from the first data set (2475, second column to 2476). Cole discloses calibrating the data as discussed above. Cole discloses that impedance values are used, and these values are obtained by inverting the data.

With regard to claim 10, Cole discloses that plotting the calibrated values is defined by plotting the calibrated values to visually represent a spatial distribution of at least one physical characteristic of a subterranean hydrocarbon reservoir (Figs. 1-6).

With regard to claim 11, Cole discloses that selecting the plurality of optimal values sorted into the plurality of bins is performed in response to comparing the plurality of values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value (2476, 2nd column).

With regard to claim 12, Cole discloses that calibrating the plurality of optimal values is performed in response to comparing the plurality of optimal values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value (2475, 2nd column, under Forward Modeling and Qualitative Inversion).

With regard to claim 13, Cole discloses a method of modeling seismic data corresponding to a subterranean reservoir containing hydrocarbons. Cole discloses

calibrating each of a first and second seismic data sets. Cole discloses subtracting the calibrated second seismic data set from the first calibrated data set to obtain the time-lapse data set (2475, 2nd column to 2476). Cole discloses calibrating the time-lapse data by calibrating pseudo values against known impedances using a known reference pressure and saturation state. Cole discloses deriving a time-lapse data set from a first seismic data set and a second seismic data set (Page 2475, Introduction; Conclusions). Cole discloses deriving a forward-modeled time-lapse data set including a plurality of physical parametric values (Page 2475-2476, Forward Modeling and Qualitative Inversion). Cole discloses sorting the plurality of values bins corresponding to the forward-modeled time-lapse data set (Page 2476, second column). Cole discloses selecting a plurality of optimal values from the plurality of bins (2476, 2nd column, 2nd to last paragraph). Cole discloses mapping the plurality of optimal values in correspondence with a plurality of subterranean locations using the time-lapse data set (2476, last paragraph to 2477, first column). Cole discloses calibrating the plurality of values and plotting the plurality of calibrated optimal physical parameter values as a visual representation of the subterranean reservoir containing hydrocarbons (Page 2477) (Figs. 1-6).

With regard to claim 14, Cole discloses that the calibrating of the first and second seismic data sets is performed in response to comparing each of the first and second seismic data sets with at least one comparison value that is a reservoir measurement value (2477, 1st full paragraph).

With regard to claim 15, Cole discloses that the first and second seismic data sets are defined by inverted first and second seismic data sets (2475, Summary; 2476). The whole paper of Cole discloses an inversion scheme for time-lapse seismic data sets used in modeling a reservoir.

With regard to claim 16, Cole discloses that deriving the forward-modeled time-lapse data set is defined by using at least one rock physics relationship ((2475, Introduction.)

With regard to claim 17, Cole discloses that the rock physics relationship is a pressure relationship, saturation relationship, or porosity relationship (2475 second column to 2476 end of page, especially 2476 Quantitative Inversion Procedure).

With regard to claim 18, Cole discloses that selecting the plurality of optimal values sorted into the plurality of bins is performed in response to comparing the plurality of values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value (2476, 2nd column).

With regard to claim 19, Cole discloses that calibrating the plurality of optimal values is performed in response to comparing the plurality of optimal values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value (2475, 2nd column, under Forward Modeling and Qualitative Inversion).

With regard to claims 20 and 21, Cole discloses that the first and second data sets included amplitude versus angle signal data (Summary, Introduction, and

Conclusion). It is known that AVA data contains the same information as amplitude versus offset data, and that AVO data can be obtained by using the angles of the AVA data.

With regard to claim 22, Cole discloses that the first and second data sets (the time-lapse data) are from the Schiehallion field. This data is reflected acoustic wave energy data.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 23-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cole in view of Cross.

With regard to claim 23, Cole discloses a method of modeling seismic data corresponding to a subterranean reservoir containing hydrocarbons. Cole discloses calibrating each of a first and second seismic data sets. Cole discloses subtracting the calibrated second seismic data set from the first calibrated data set to obtain the time-lapse data set (2475, 2nd column to 2476). Cole discloses calibrating the time-lapse data by calibrating pseudo values against known impedances using a known reference pressure and saturation state. Cole discloses deriving a time-lapse data set from a first seismic data set and a second seismic data set (Page 2475, Introduction; Conclusions).

Cole discloses deriving a forward-modeled time-lapse data set including a plurality of physical parametric values (Page 2475-2476, Forward Modeling and Qualitative Inversion). Cole discloses sorting the plurality of values bins corresponding to the forward-modeled time-lapse data set (Page 2476, second column). Cole discloses selecting a plurality of optimal values from the plurality of bins (2476, 2nd column, 2nd to last paragraph). Cole discloses mapping the plurality of optimal values in correspondence with a plurality of subterranean locations using the time-lapse data set (2476, last paragraph to 2477, first column). Cole discloses calibrating the plurality of values and plotting the plurality of calibrated optimal physical parameter values as a visual representation of the subterranean reservoir containing hydrocarbons (Page 2477) (Figs. 1-6). Cole does not disclose a computer with a processor and a computer-readable storage medium coupled in communication with the processor. Cole does not disclose that the computer stores the first and second seismic data sets and the plurality of rock physics relationships. Cole does not disclose that a program code causes the processor to perform the method of modeling seismic data described above. Cole does show graphs that appear to have been made on a computer, and it is probable that a computer was used to perform the modeling and to produce and store the data sets discussed in the paper. Cole just does not specifically disclose that a computer was used. Cross discloses a computer with a processor and a storage medium that holds data sets and rock physics relationships. Cross discloses that the processor executes a program that creates a forward model of seismic data by an inverse method (Column 4, Lines 10-34). Since Cross discloses a similar method of modeling seismic data, and

also discloses similar data for use with similar hydrocarbon reservoirs to those used by Cole, it would be obvious to use a computer with storage and a processor in the method of Cole also. It would be obvious to modify Cole to include a computer with a processor and memory as disclosed by Cross in order to have a method of carrying out the method on any data that is input into the system and to have a way of performing the calculations and displaying the results of the modeling.

With regard to claim 24, Cole discloses that the first and second data sets included amplitude versus angle signal data (Summary, Introduction, and Conclusion). It is known that AVA data contains the same information as amplitude versus offset data, and that AVO data can be obtained by using the angles of the AVA data.

With regard to claim 25, Cole discloses that the first and second data sets (the time-lapse data) are from the Schiehallion field. This data is reflected acoustic wave energy data.

With regard to claim 26, Cole discloses that the calibrating of the first and second seismic data sets is performed in response to comparing each of the first and second seismic data sets with at least one comparison value that is a reservoir measurement value (2477, 1st full paragraph).

With regard to claim 27, With regard to claim 15, Cole discloses that the first and second seismic data sets are defined by inverted first and second seismic data sets (2475, Summary; 2476). The whole paper of Cole discloses an inversion scheme for time-lapse seismic data sets used in modeling a reservoir.

With regard to claim 28, Cole discloses that the rock physics relationship is a pressure relationship, saturation relationship, or porosity relationship (2475 second column to 2476 end of page, especially 2476 Quantitative Inversion Procedure).

With regard to claims 29 and 30, Cole discloses that selecting the plurality of optimal values sorted into the plurality of bins is performed in response to comparing the plurality of values with at least one comparison value, selecting the plurality of optimal values in response to the comparison, and wherein the at least one comparison value includes a measurement value corresponding to a subterranean reservoir containing hydrocarbons (2476, 2nd column and 2477 2nd column).

With regard to claims 31 and 32, Cole discloses that calibrating the plurality of optimal values is performed in response to comparing the plurality of optimal values with at least one comparison value, and wherein the at least one comparison value optionally includes a reservoir measurement value (2475, 2nd column, under Forward Modeling and Qualitative Inversion and 2477).

With regard to claim 33, Cole discloses plotting the plurality of optimal values on a computer (Figs. 1-6) (2476 and 2477).

With regard to claim 34, Cole discloses that the spatially distributed physical characteristic of the subterranean reservoir containing hydrocarbons is defined by porosity, pressure, and saturation (2476).

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Curtis, who discloses time lapse VSP monitoring of a reservoir.

Talwani, who discloses hydrocarbon reservoir monitoring.

Ross, who discloses a method of modeling.

Nickel, who discloses creating estimates of a subsurface using first and second data sets.

Castagna, who discloses modeling a subsurface.

Leaney, who discloses modeling and calibrating data sets.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Scott A Hughes whose telephone number is 703-305-0430. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Tarcza can be reached on 703-306-4171. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

SAH

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